A hand is shown holding a single matchstick with a red band, positioned above a large, disorganized pile of matchsticks. The matchsticks in the pile have various colored bands: red, blue, yellow, and pink. The background is a plain, light-colored surface.

# REFACTORING LEGACY CODE



@DocOnDev / @WeAreCTO2

**CTO2**  
TALENT + TECHNOLOGY



# CTO2

TALENT + TECHNOLOGY



**DOC NORTON**  
**CO-FOUNDER + CEO**  
**[DOC@WEARECTO2.COM](mailto:DOC@WEARECTO2.COM)**



@DocOnDev / @WeAreCTO2

# WHAT IS REFACTORING?



@DocOnDev / @WeAreCTO2



# REFACTORING

Change the implementation without Changing the Behavior

- Improves nonfunctional attributes of the software
  - \* Improved code readability
  - \* Reduced complexity
  - \* Improved source-code maintainability
  - \* More expressive internal architecture or object model
  - \* Improved extensibility
- May also resolve hidden, dormant, or undiscovered bugs



***By continuously improving the design of code, we make it easier and easier to work with. This is in sharp contrast to what typically happens: little refactoring and a great deal of attention paid to expediently adding new features. If you get into the hygienic habit of refactoring continuously, you'll find that it is easier to extend and maintain code.***

**– JOSHUA KERIEVSKY  
REFACTORING TO PATTERNS**





# WHAT IS LEGACY CODE?



@DocOnDev / @WeAreCTO2



# LEGACY CODE

## So many definitions...

- Difficult to change
- Difficult to understand
- Get late feedback when you do change it
- Not properly / sufficiently tested
- Would rather replace it than work with it
- Written in out-dated tools/technologies



# LEGACY CODE

## So many definitions...

- **Difficult to change**
- **Difficult to understand**
- **Get late feedback when you do change it**
- **Not properly / sufficiently tested**
- Would rather replace it than work with it
- Written in out-dated tools/technologies





# LEGACY CODE

## So many definitions...

- **Difficult to change**
  - **BECAUSE IT IS Difficult to understand**
- **Get late feedback when you do change it**
  - **BECAUSE IT IS Not properly / sufficiently tested**

# TRIVIA GAME

<https://github.com/DocOnDev/trivia>



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# TRIVIA GAME

<https://github.com/DocOnDev/trivia>

Allow for games with 3, 4, 5, or 6 categories.

Pop, Science, Sports, Rock, History, Food

A wrong answer is a fine of 1 gold coin.

If player cannot pay fine, send them to penalty box.





# JUST CODE

Allow for games with 3, 4, 5, or 6 categories.

Pop, Science, Sports, Rock, History, Food

A wrong answer is a fine of 1 gold coin.

If player cannot pay fine, send them to penalty box.

A digital timer display showing 45:00. The numbers are black with a white outline and a slight shadow, set against a white background with a thin blue border.





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15:00

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**HUDDLE TIME**



# CLEAN FIRST

Allow for games with 3, 4, 5, or 6 categories.

Pop, Science, Sports, Rock, History, Food

A wrong answer is a fine of 1 gold coin.

If player cannot pay fine, send them to penalty box.

45 : 00







**REFACTORED WITH NO TESTS**





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15:00

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**HUDDLE TIME**



**You need  
some tests yo!**





# GOLDEN MASTER



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# GOLDEN MASTER



<http://texttest.sourceforge.net/>

---

<http://texttest.readthedocs.io/>

45 : 00



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15:00

**CTO<sup>2</sup>**  
TALENT + TECHNOLOGY



**HUDDLE TIME**





@DocOnDev / @WeAreCTO2

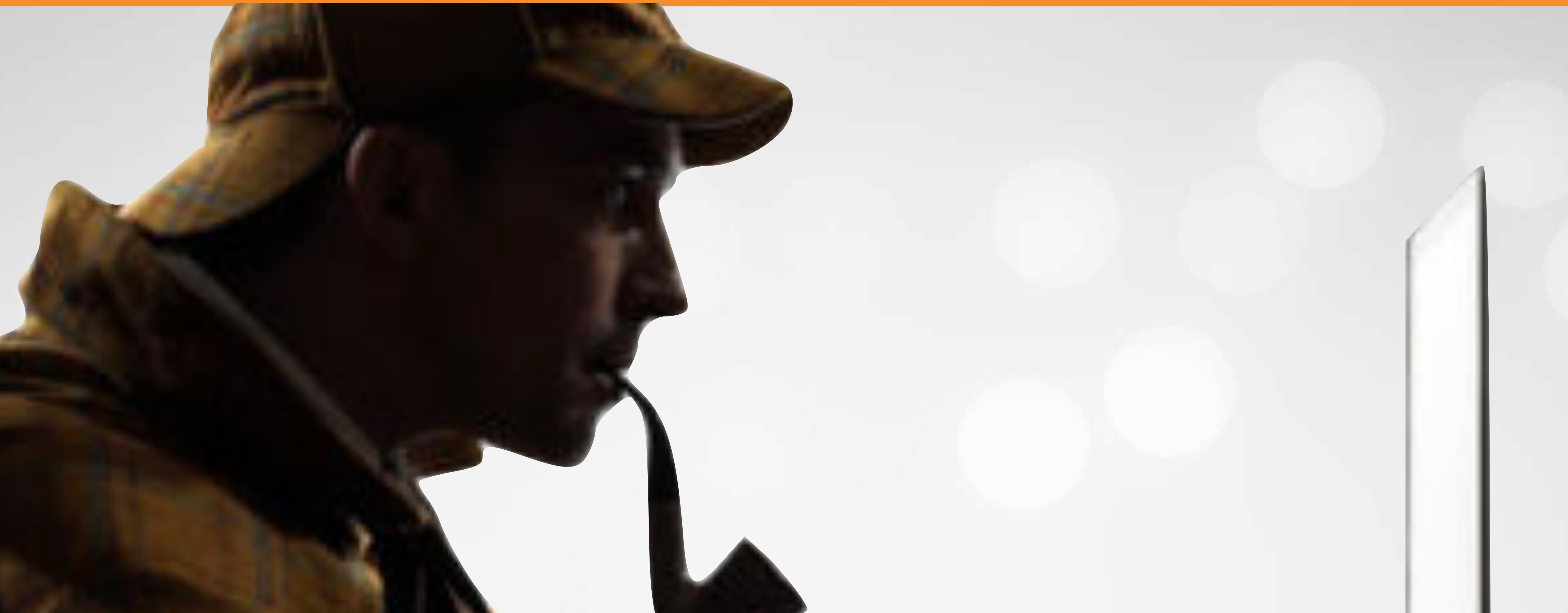
15:00

**CTO2**  
TALENT + TECHNOLOGY



**BREAK**





# CODE PROFILING



# CODE CHARACTERIZATION



# TEST NAMES

## **Character\_**

Characterization, not verified - should pass.

## **Character\_Invalid\_**

Reviewed and is NOT wanted - should pass.



# CHARACTER TESTS

15:03



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15:00

**CTO2**  
TALENT + TECHNOLOGY



**HUDDLE TIME**





# MIKADO METHOD



# WHY MIKADO?

- Incremental Approach
  - Lower Risk
  - Keeps Code Base Stable for Duration of Large Refactoring
- Change Map Improves Communication
- Goal Focused



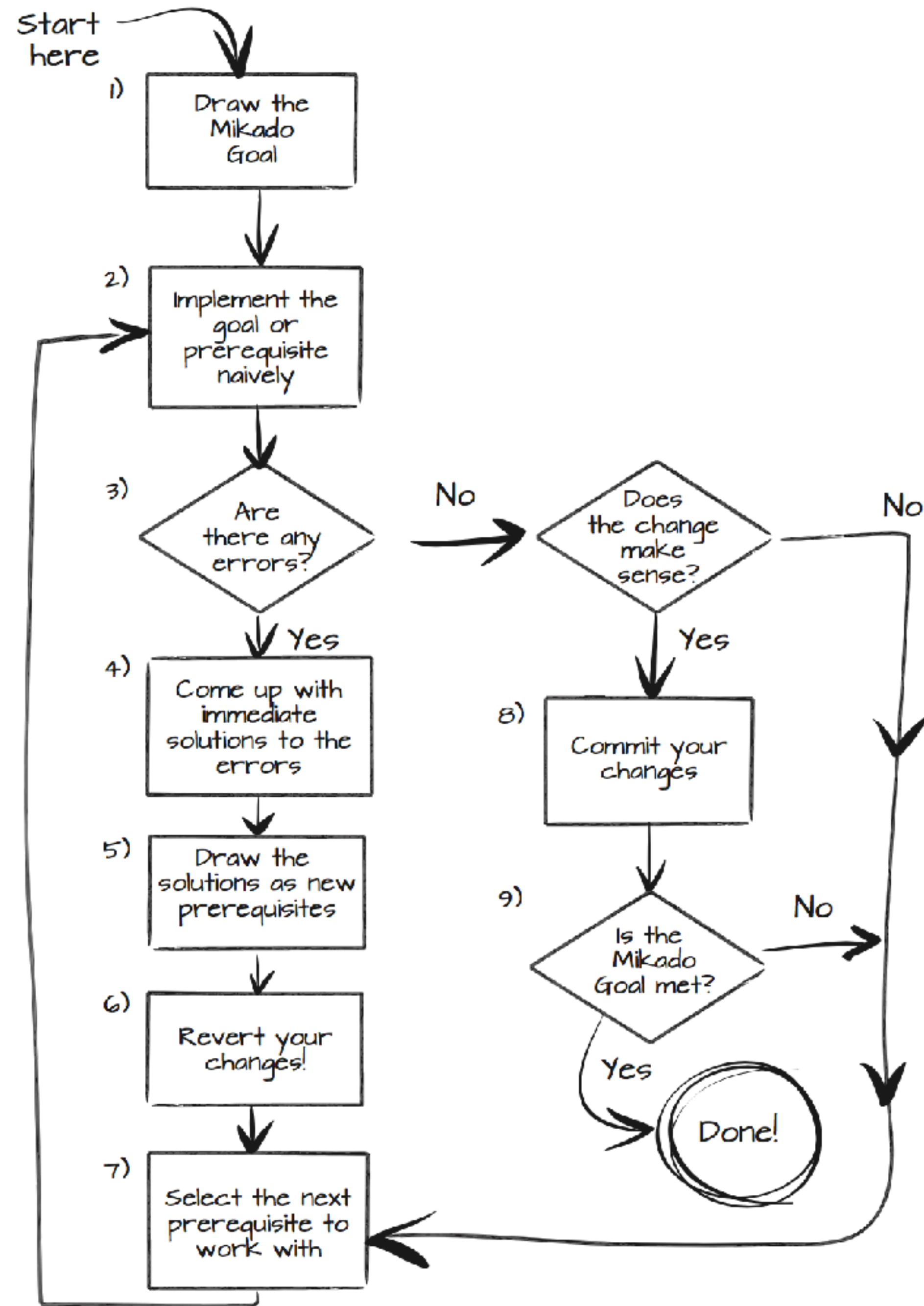


Figure 1.3 A process chart describing the Mikado Method

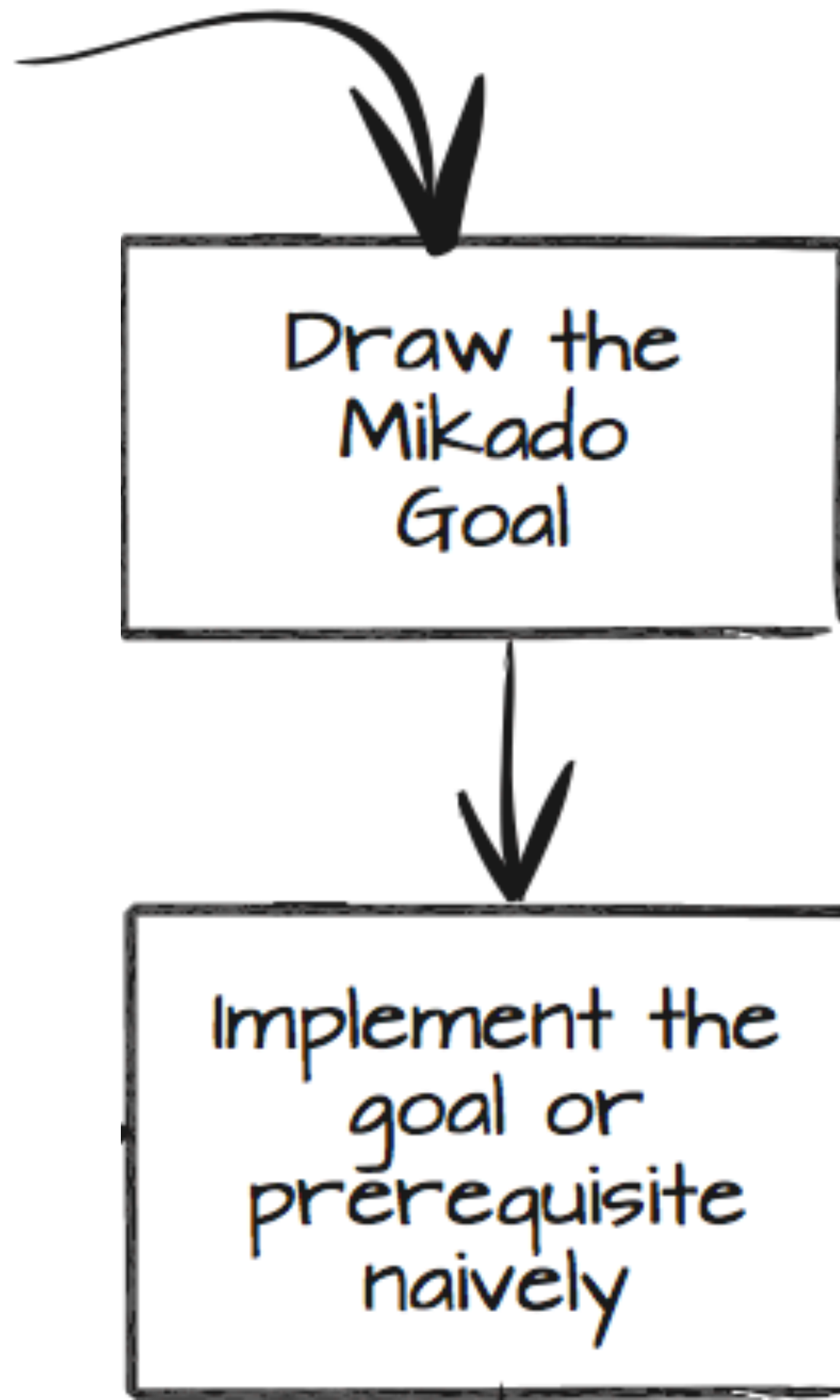


Start  
here



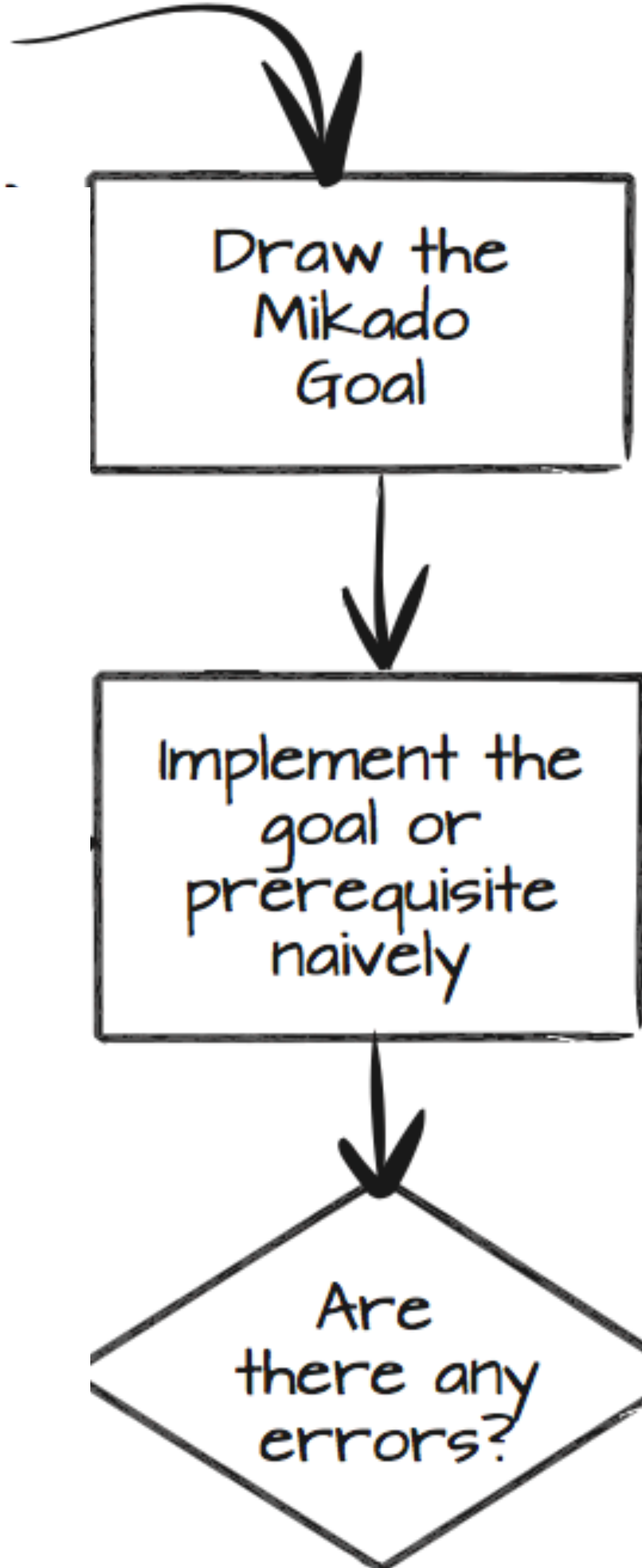


Start  
here

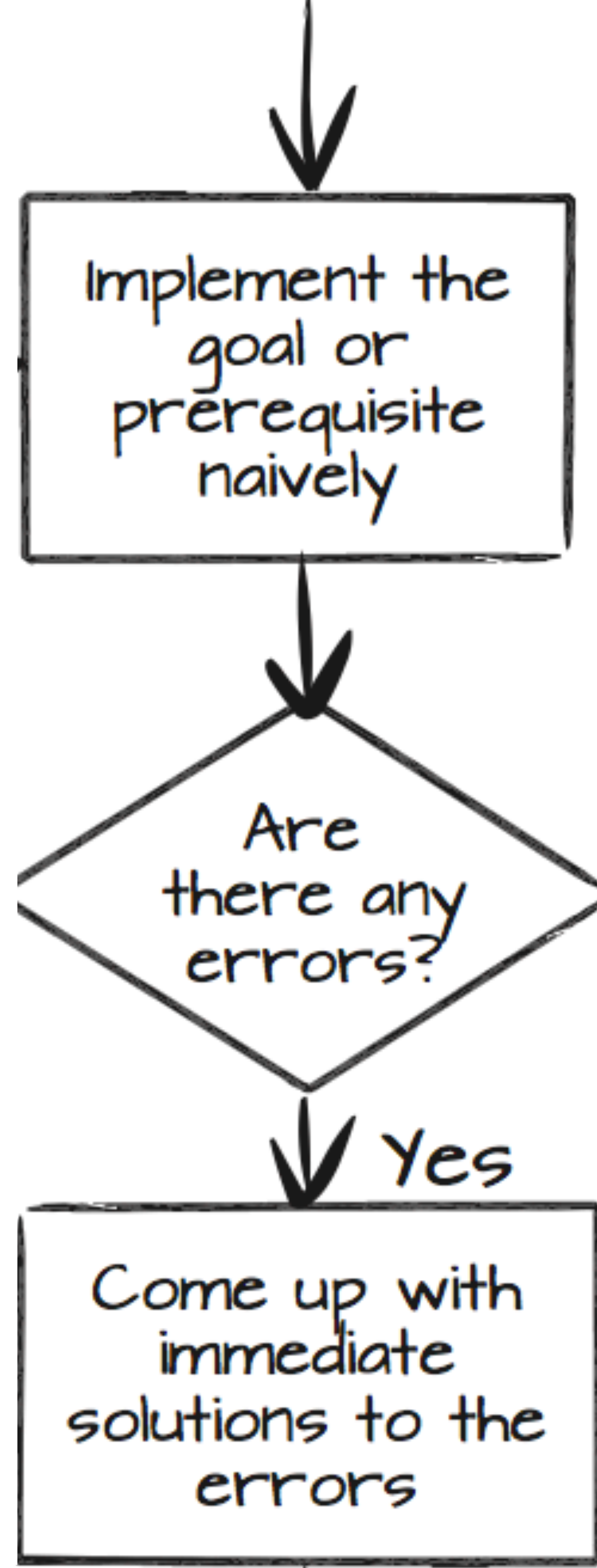




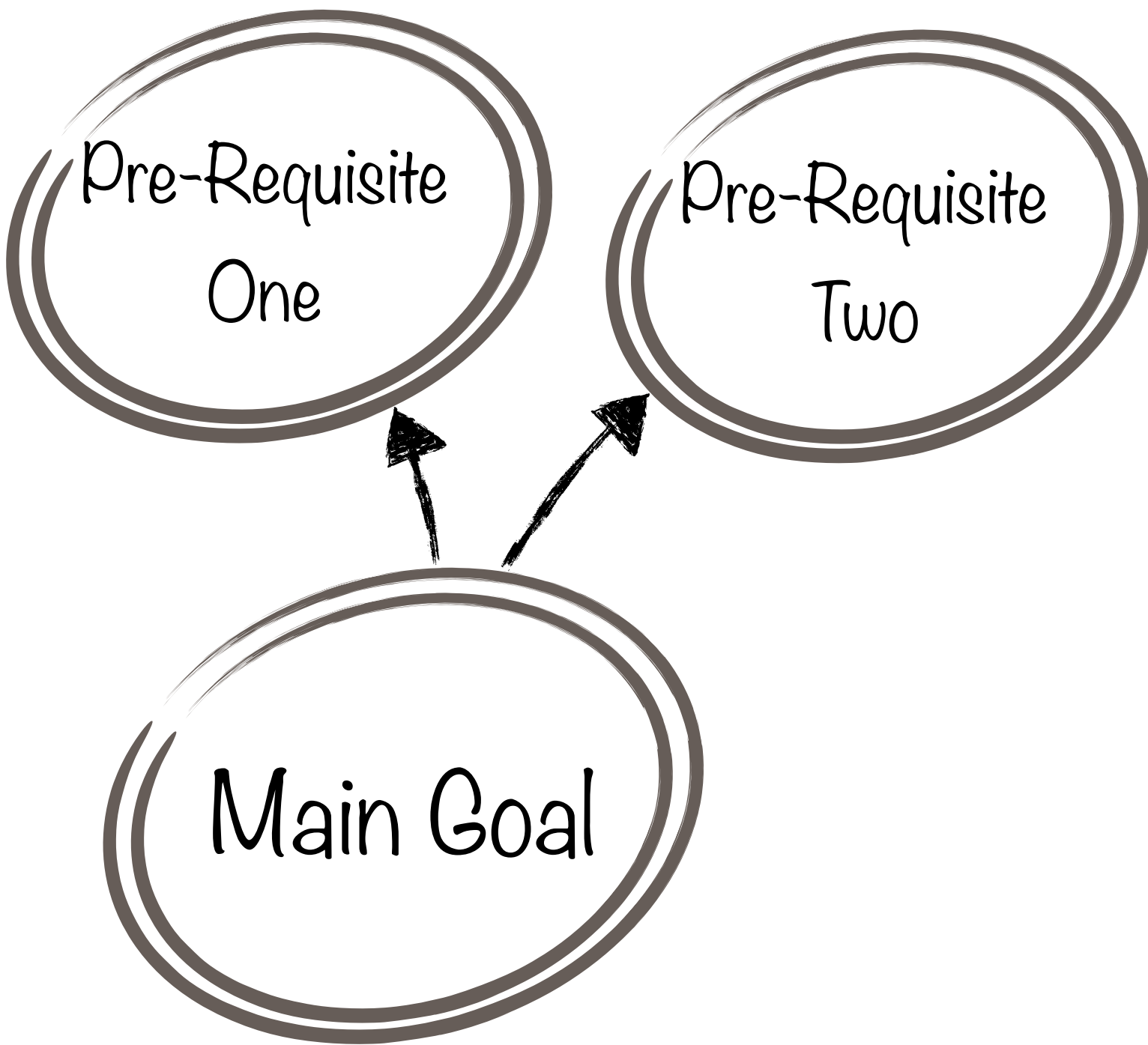
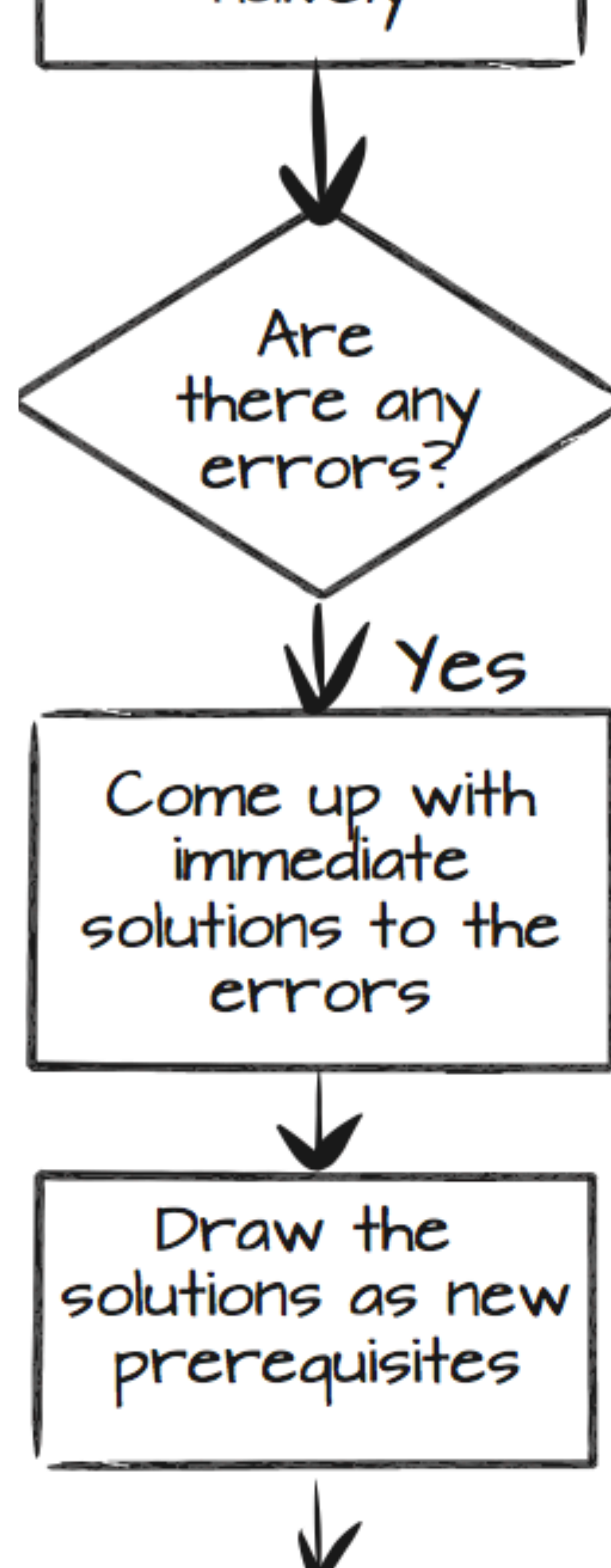
Start  
here



Main Goal





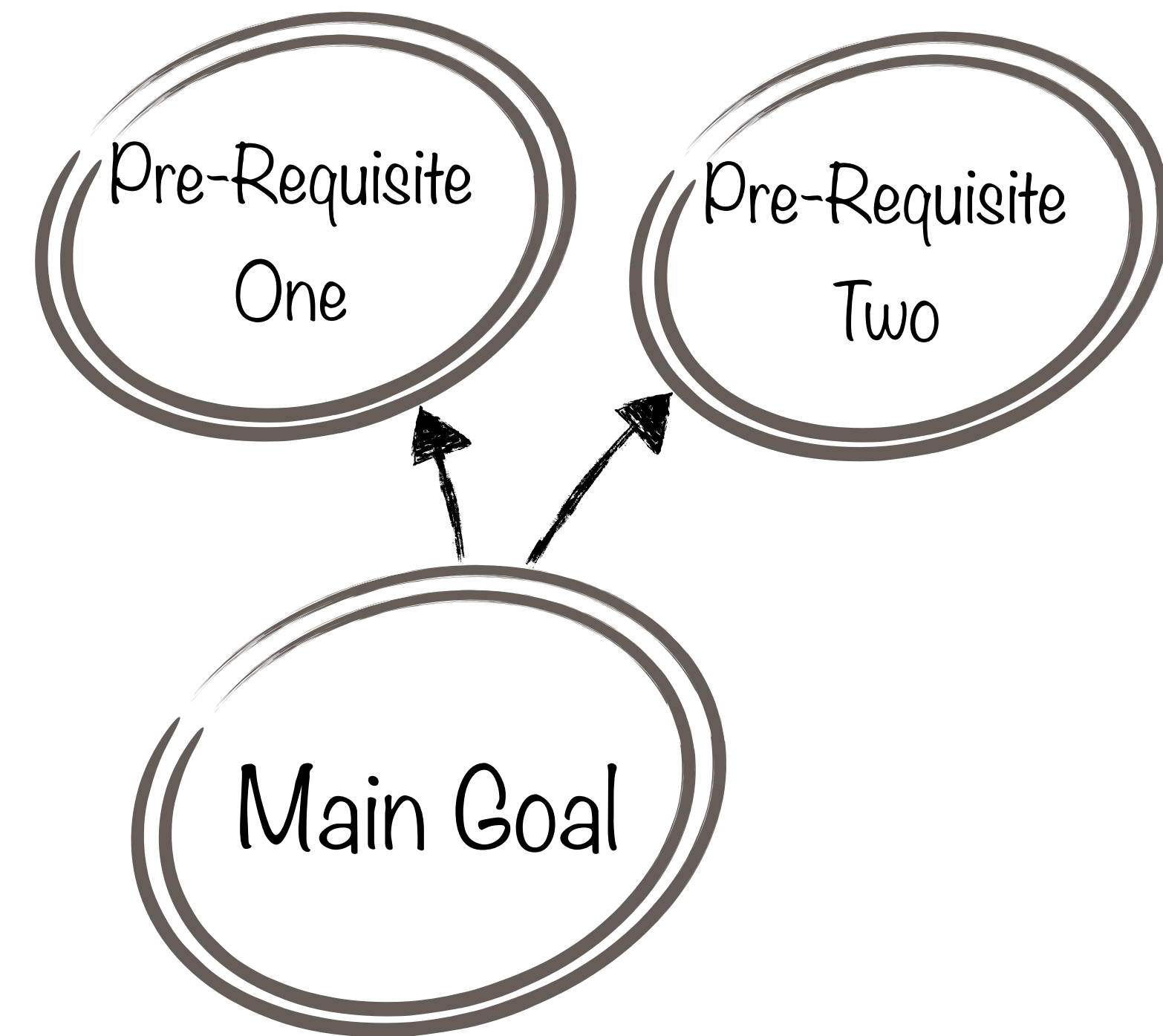


Come up with immediate solutions to the errors

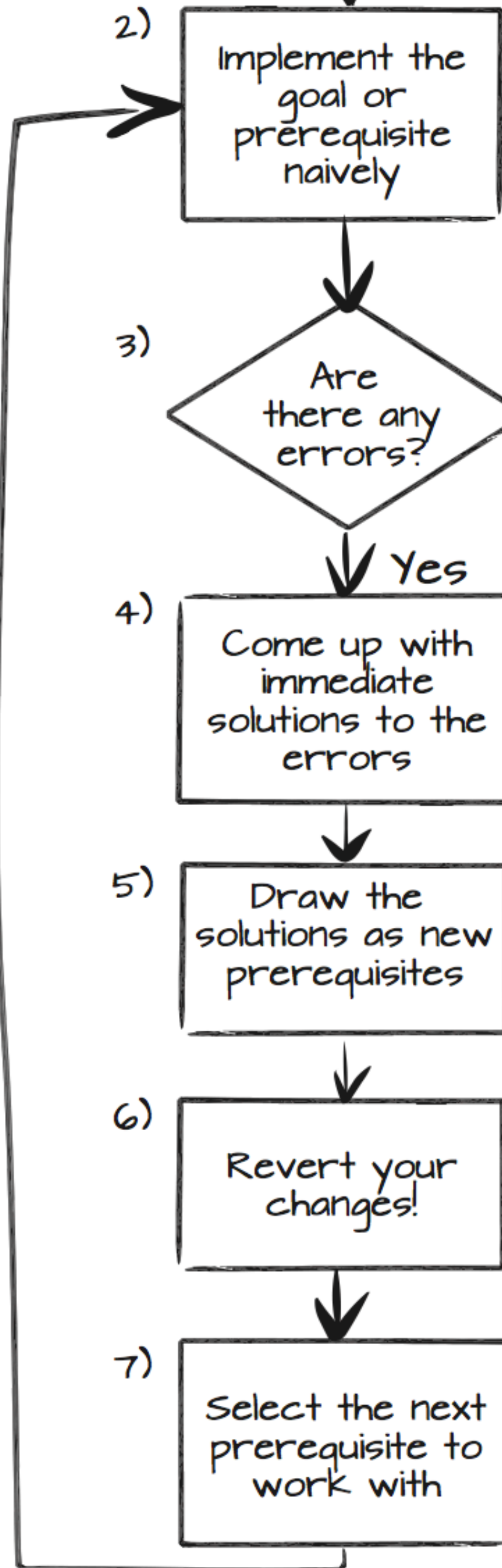
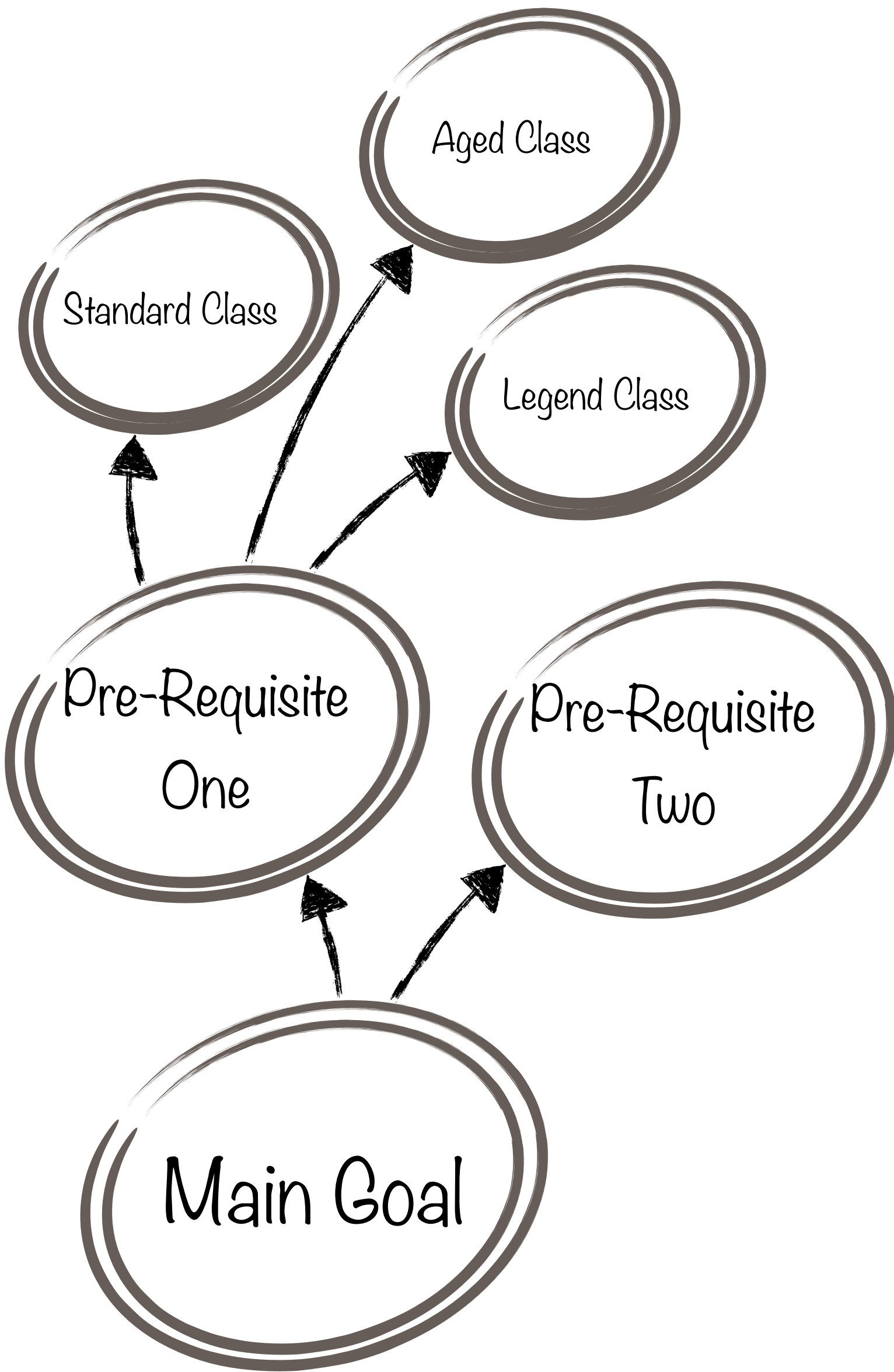
Draw the solutions as new prerequisites

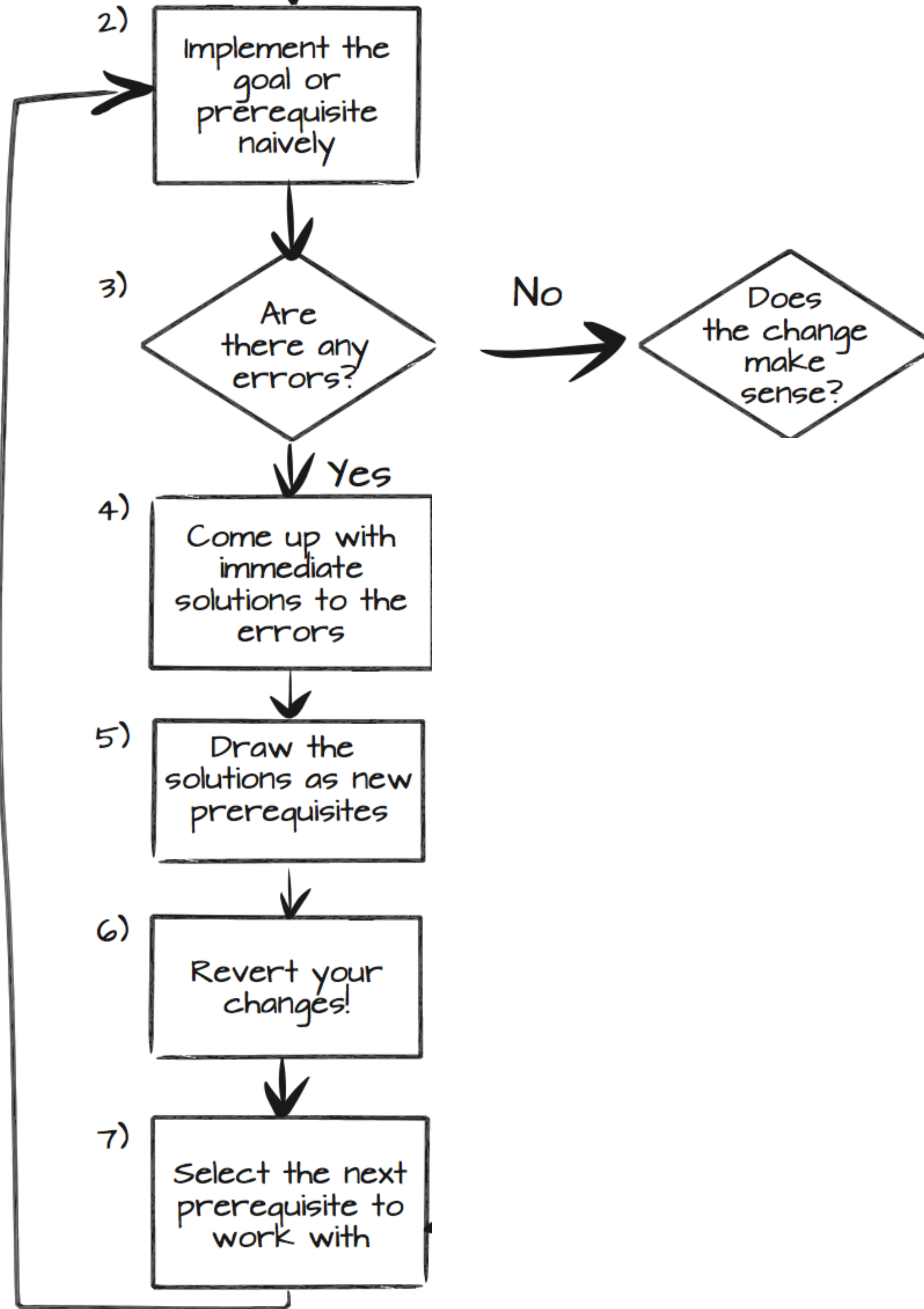
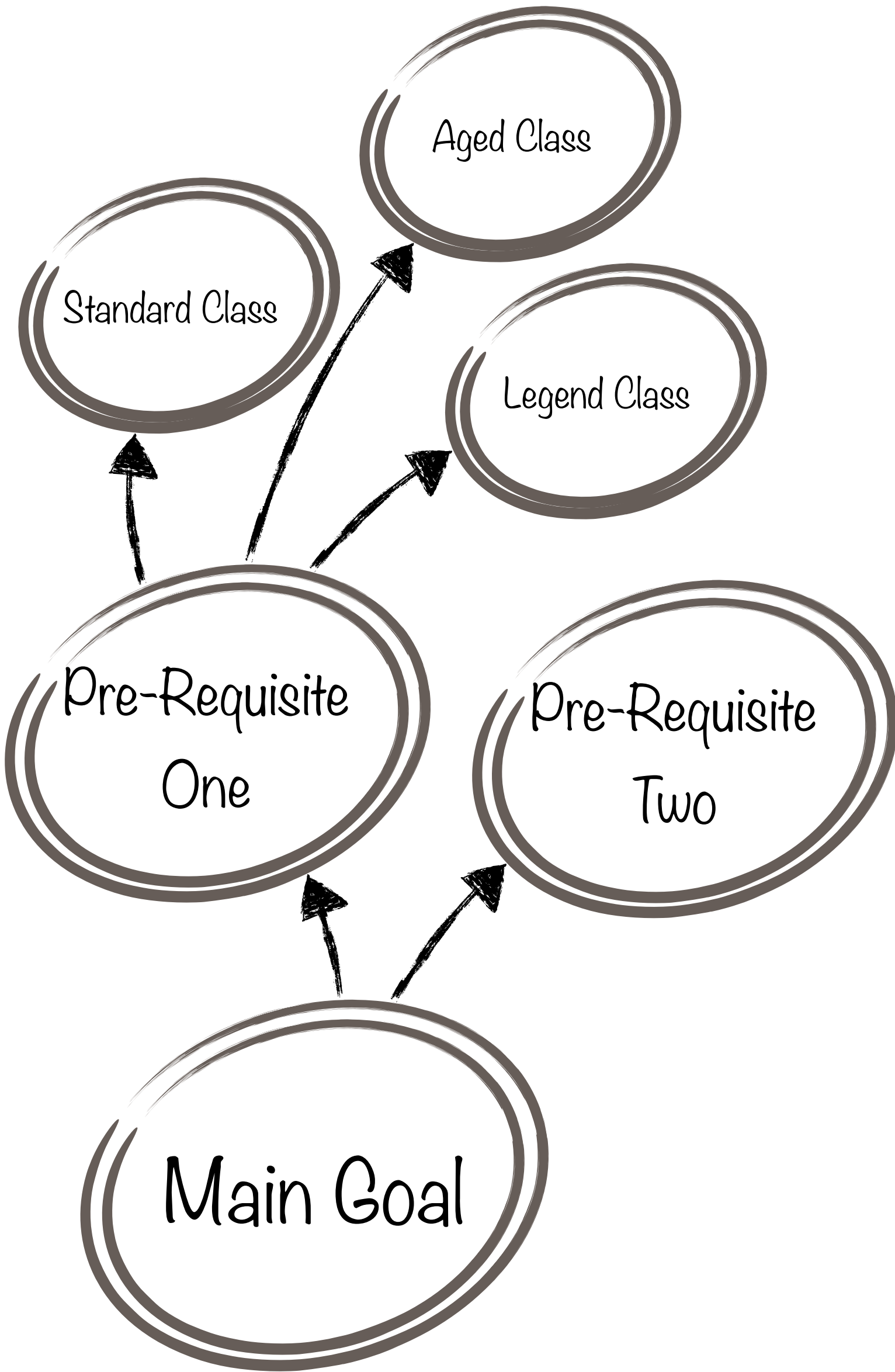
Revert your changes!

Select the next prerequisite to work with

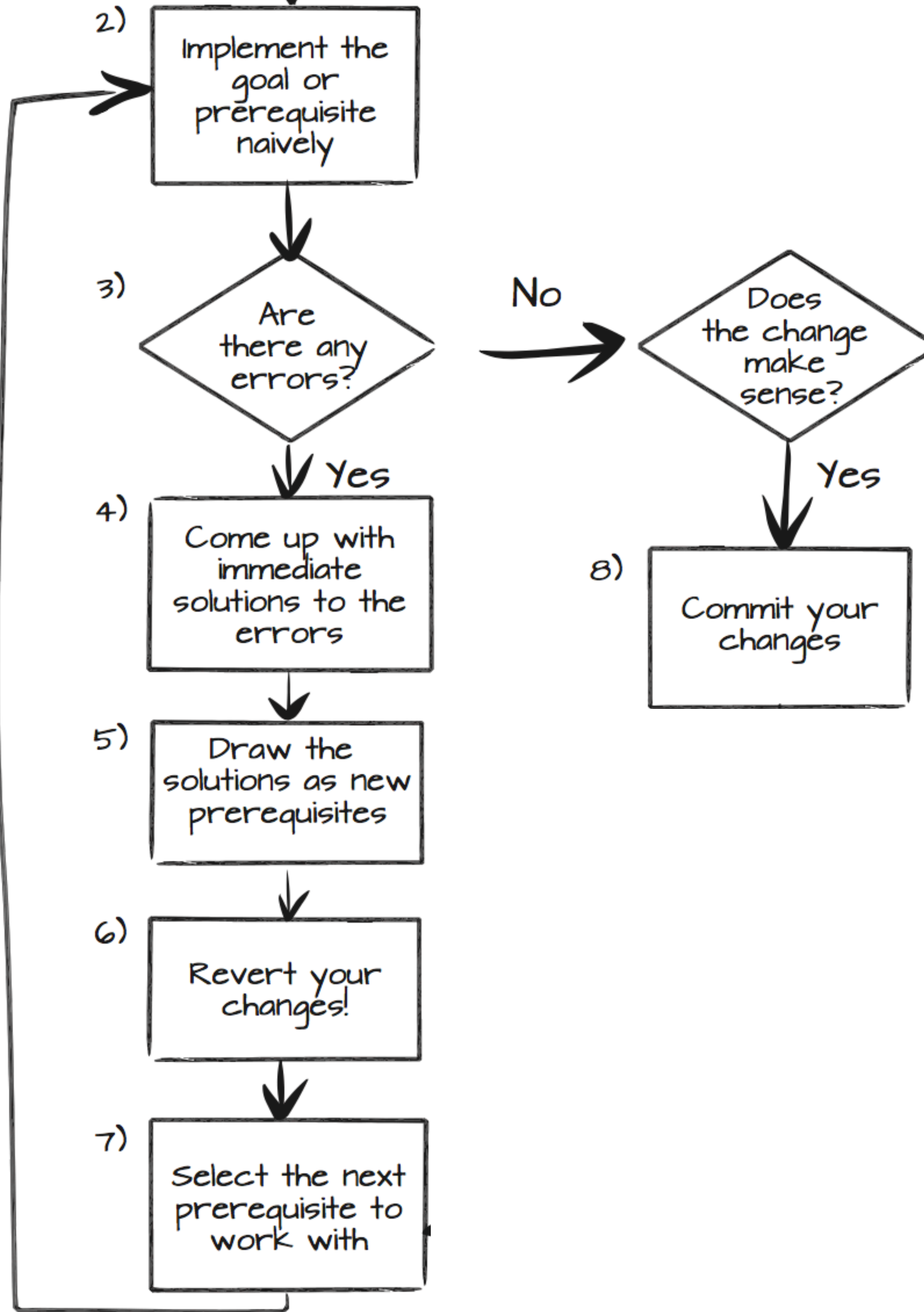
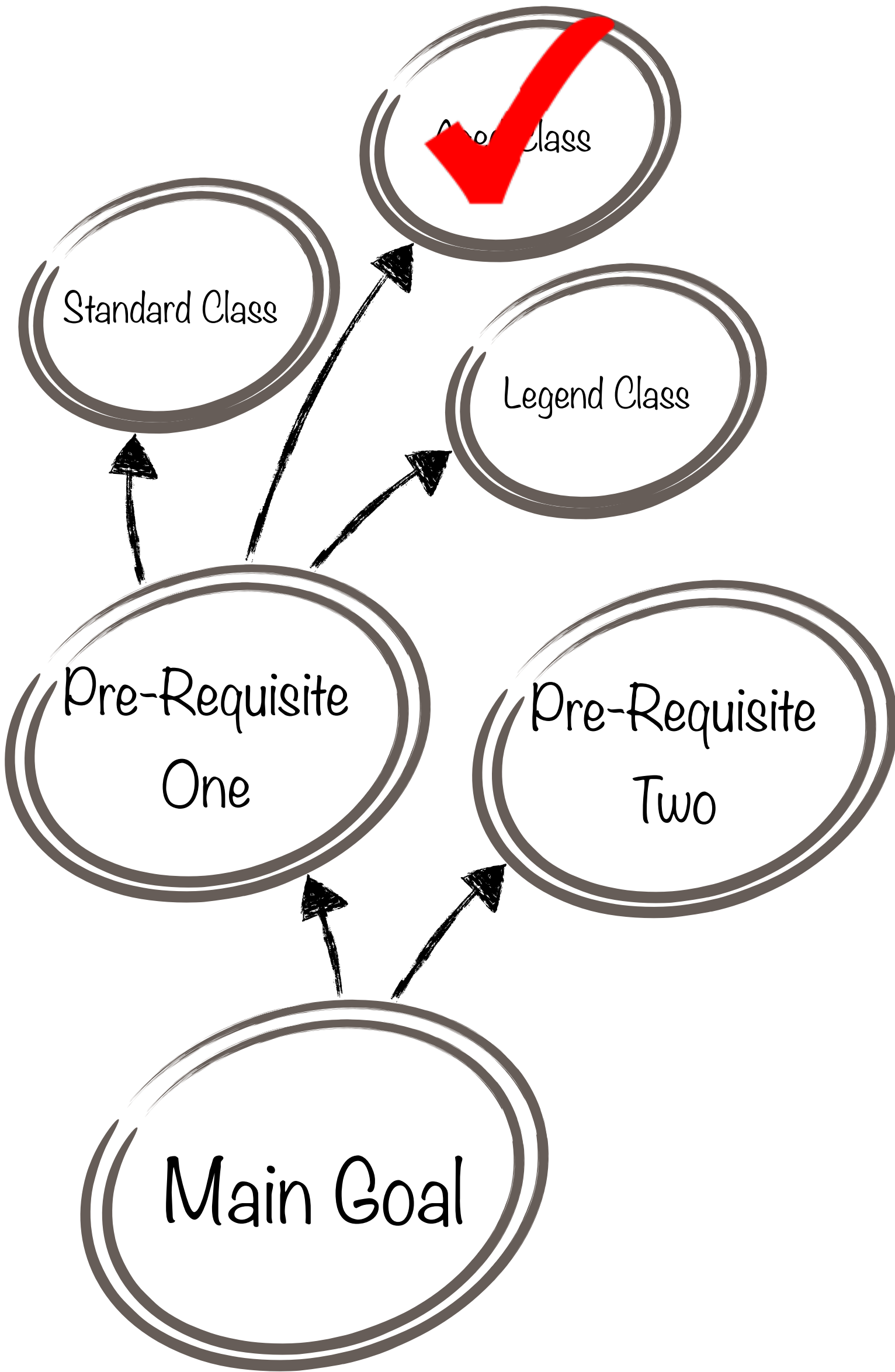


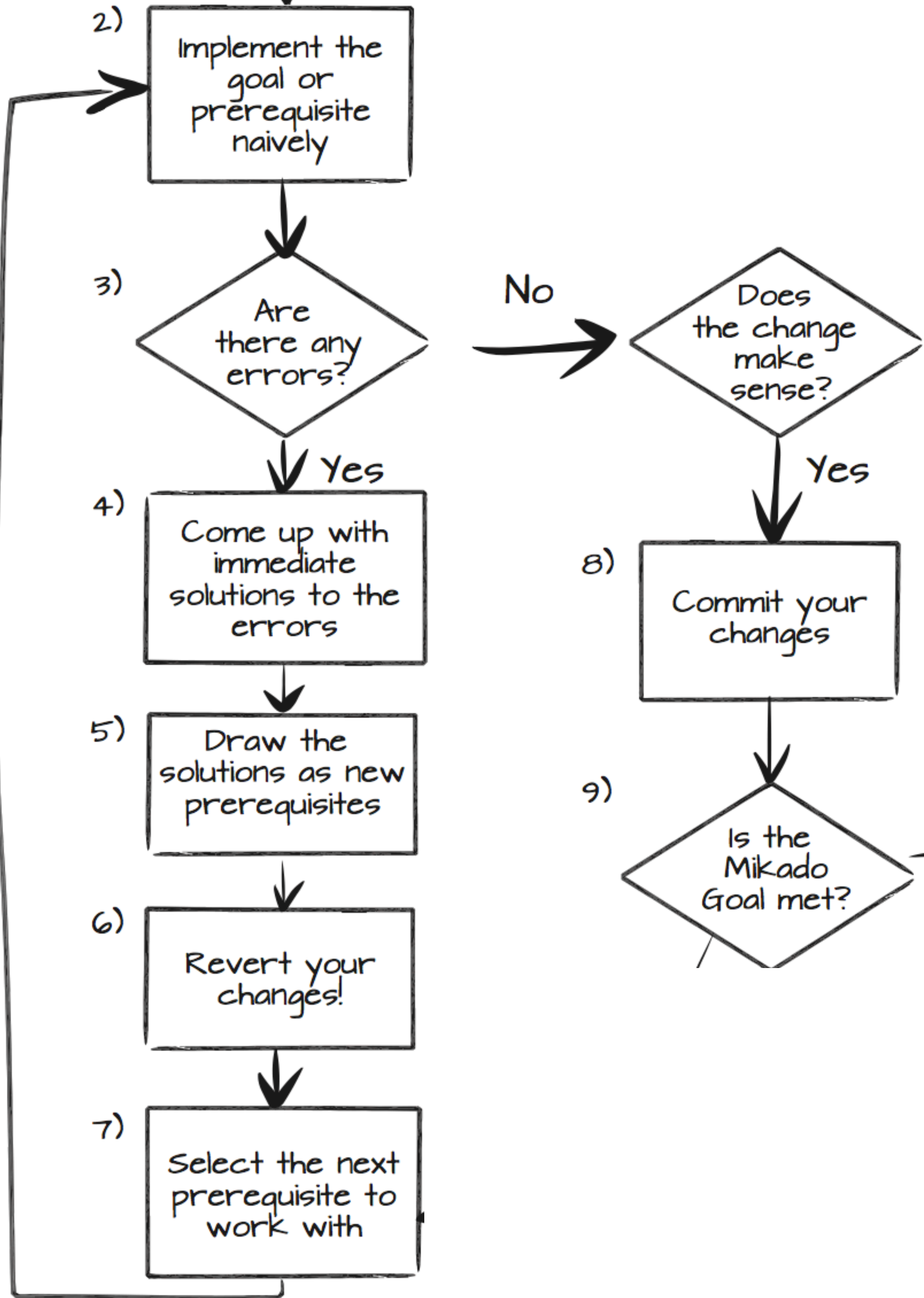
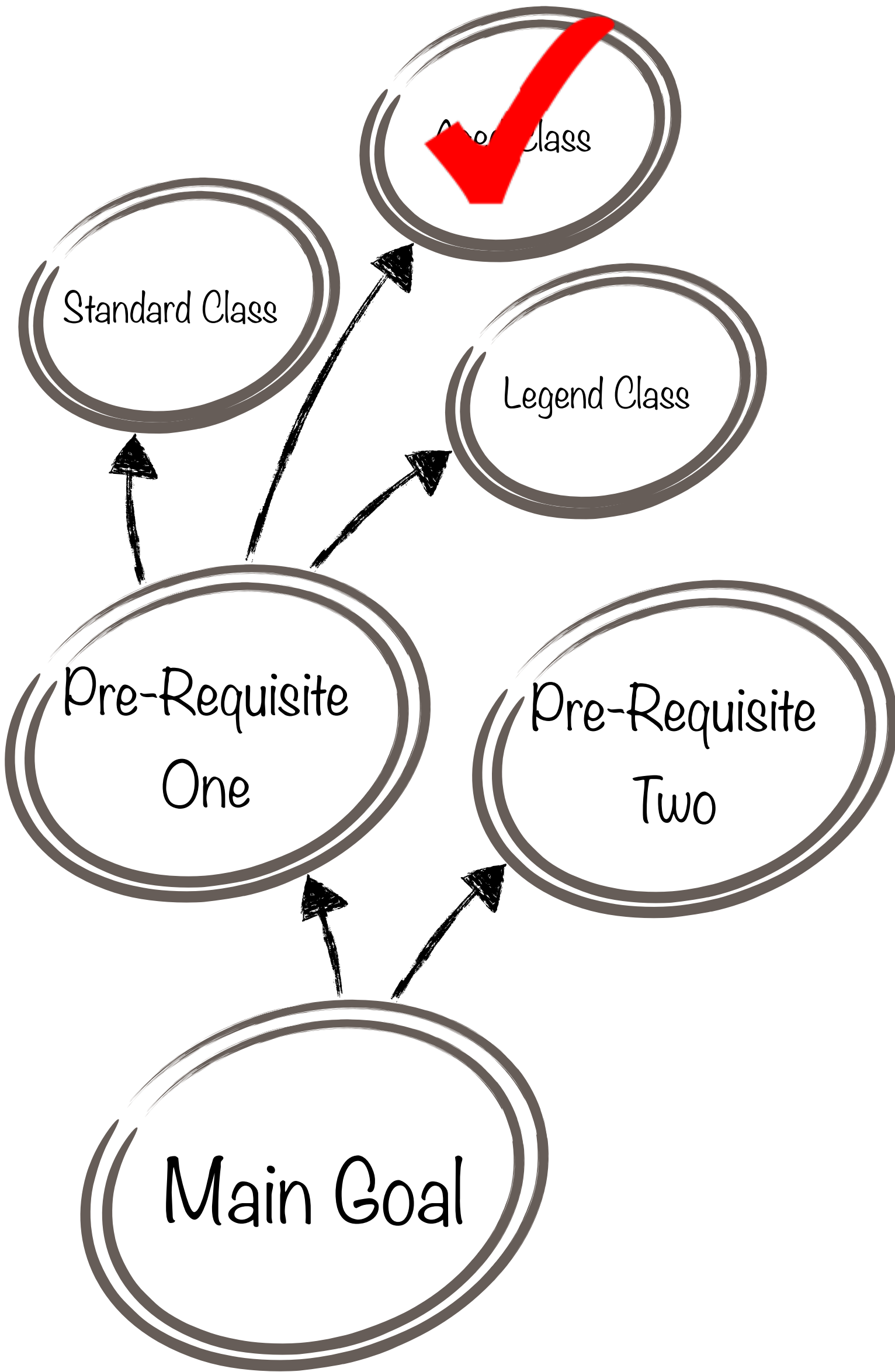




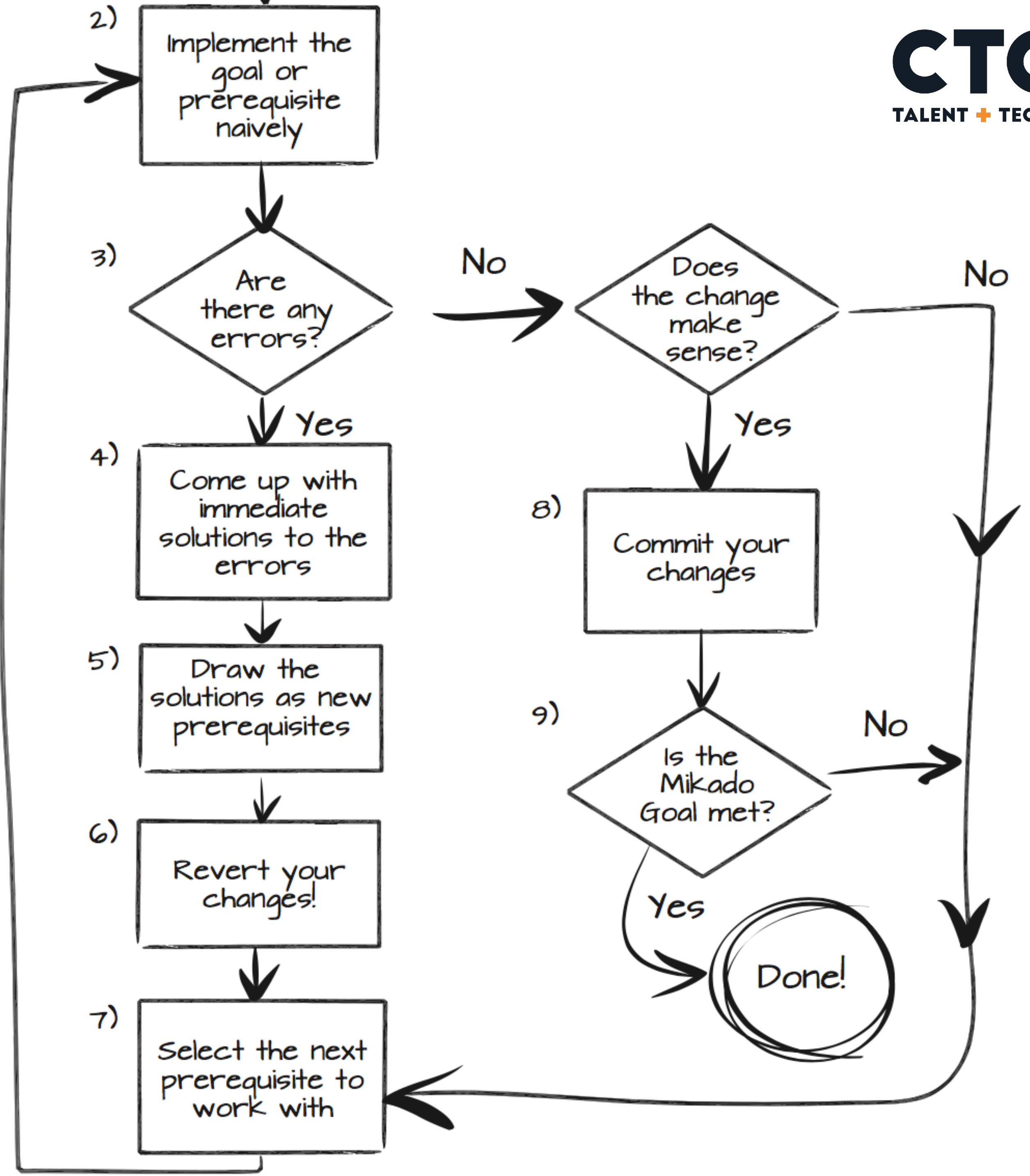
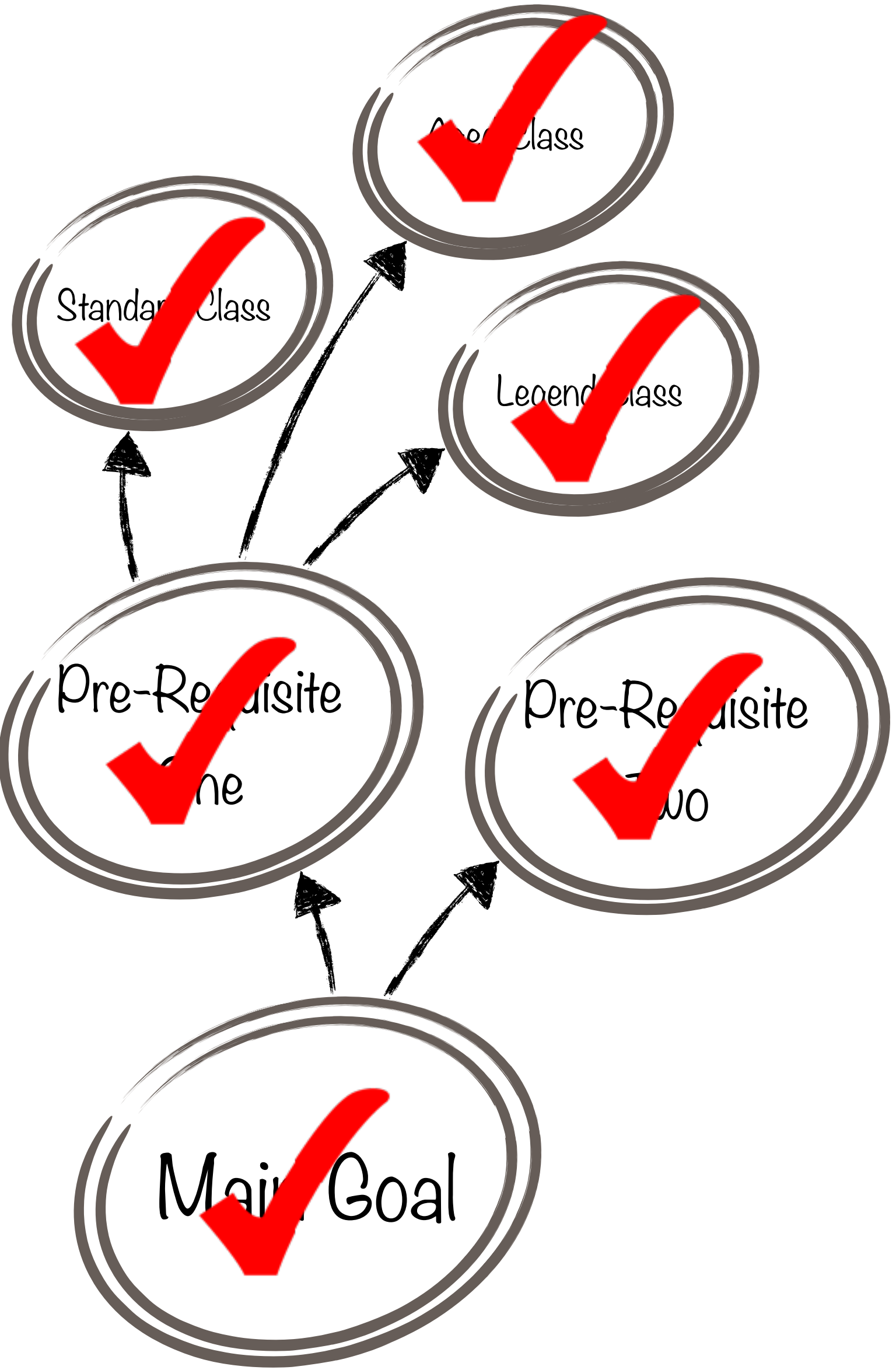
















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15:00

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**BREAK**

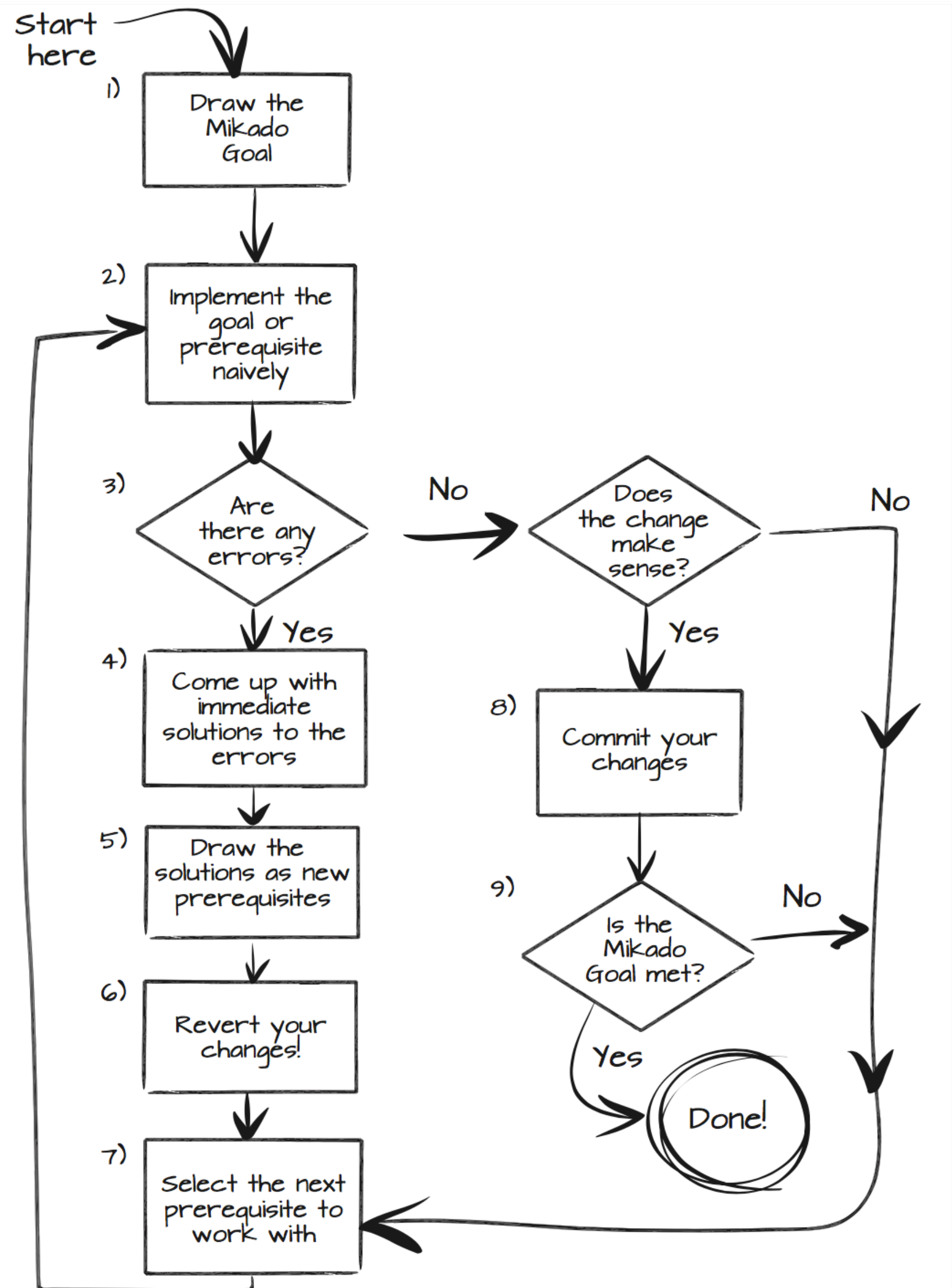


# MIKADO METHOD

Allow for games with 3, 4, 5, or 6 categories.

Pop, Science, Sports, Rock, History, Food

A wrong answer is a fine of 1 gold coin.  
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45:00







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15:00

**CTO2**  
TALENT + TECHNOLOGY



**HUDDLE TIME**

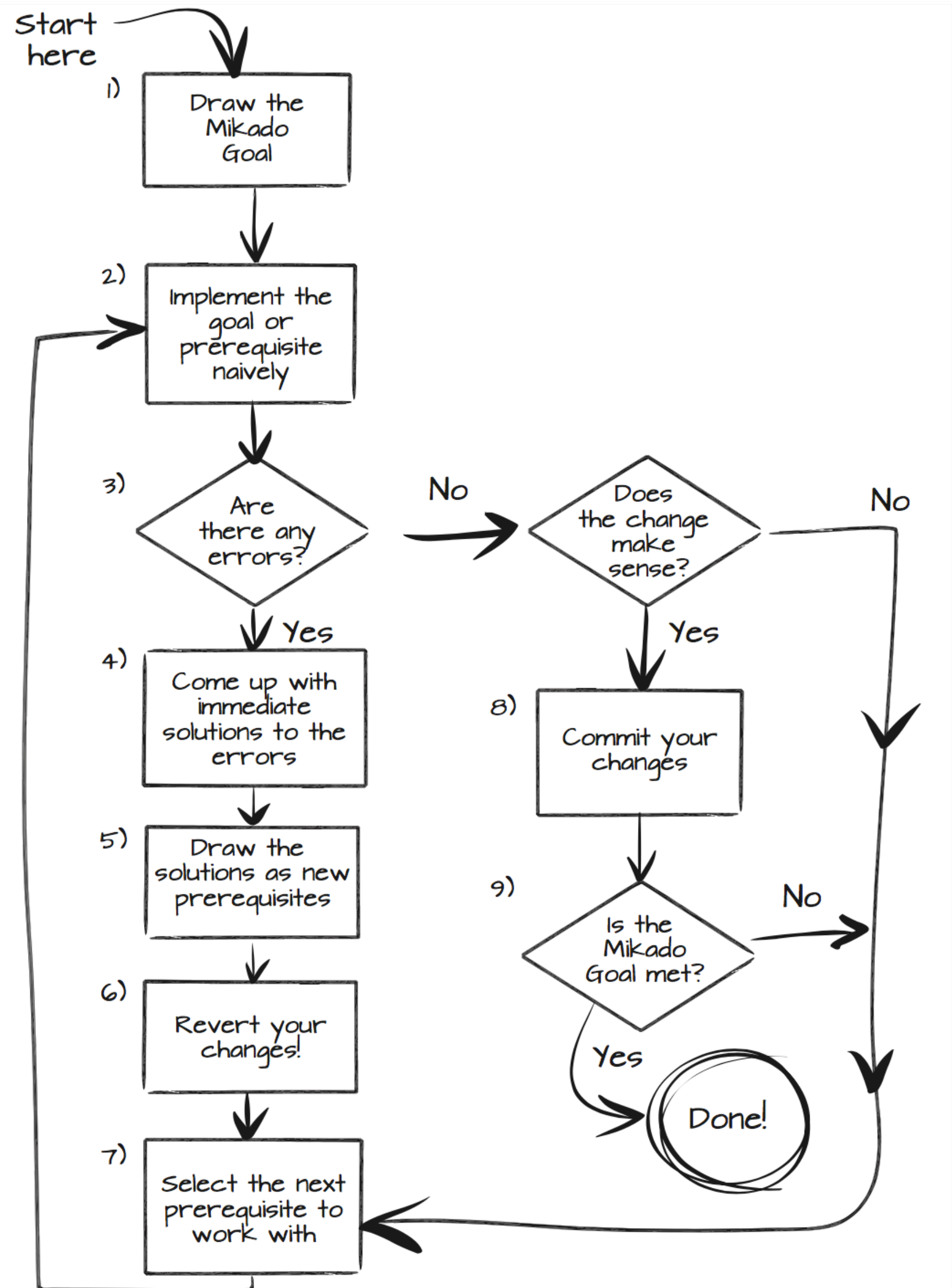


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45:00







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15:00

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**HUDDLE TIME**



**THANK YOU!!!**

**REFACTORING  
LEGACY CODE**



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- Trivia Game - <https://github.com/DocOnDev/trivia>
- Golden Master - <https://hashrocket.com/blog/posts/gold-master-testing>
- Approval Testing (Golden Master) - <https://www.infoq.com/news/2017/02/approval-testing-texttest>
- Code Profiling - <http://docondev.com/blog/2015/09/code-profiling>
- Characterization Testing - <https://michaelfeathers.silvrback.com/characterization-testing>